

BLISS (A. A.)

*Compliments of
The Author.*

AMERICAN ASSOCIATION TO PROMOTE THE TEACHING
OF SPEECH TO THE DEAF.

Fourth Summer Meeting,

CHAUTAUQUA, N. Y., JULY, 1894.

[PROCEEDINGS ISSUED IN SECTIONS.]

ABNORMALITIES OF THE UPPER RESPIRATORY TRACT AND EAR, FOUND COMMONLY AMONG DEAF-MUTES

BY

ARTHUR AMES BLISS, A. M., M. D.



ROCHESTER :

WESTERN NEW YORK INSTITUTION FOR DEAF-MUTES.

1894.

ABNORMALITIES OF THE UPPER RESPIRATORY
TRACT AND EAR, FOUND COMMONLY
AMONG DEAF-MUTES.

BY

ARTHUR AMES BLISS, A. M., M. D.,

LARYNGOLOGIST TO THE GERMAN HOSPITAL, PHILADELPHIA; LARYNG
OLOGIST AND AURIST TO THE PENNSYLVANIA INSTITUTION
FOR THE DEAF AND DUMB; FELLOW OF THE
AMERICAN LARYNGOLOGICAL
ASSOCIATION, Etc.,
PHILADELPHIA, PENNSYLVANIA.

ABNORMALITIES OF THE UPPER RESPIRATORY TRACT AND EAR FOUND COMMONLY AMONG DEAF-MUTES.

LECTURE I.

At the annual meetings of this Association, one of which was held in the summer of 1891, and again in 1892, you have had the privilege of hearing lectures by Dr. Hewson and Dr. Harrison Allen which have described most thoroughly the anatomy of the organs of speech and hearing, as well as the physiology of these parts. There has been brought to your attention, also, some of the abnormal conditions found in the organs of speech. So fully and ably have the anatomy and physiology of the respiratory tract and of the ear been presented for your consideration, that it would be quite unnecessary for me to review these subjects, although I feel far from certain, that many of my hearers can recall but a small part of what Dr. Hewson so clearly laid before you. Doubtless, however, enough remains in your memories, to which your own study and investigation have added greatly, to enable us to avoid these important, yet time-consuming subjects.

It is most important that these medical addresses should, however, bear certain relations to one another, and thus form parts of a continuous course. For this reason, I have chosen to attempt a presentation of certain abnormalities of the Upper Respiratory Tract, which are found very frequently among deaf-mutes, and it is my hope, that, imperfectly as I fear this subject will be handled by me, there may still be brought to your attention some facts which may be of service to you in your noble work as teachers of the oral system. Before taking up my subject in detail, I feel that, for a proper understanding of terms and of conditions of disease more or less new to many who will hear them, it is proper to clear the way by a very general reference to certain anatomical points.¹

Anatomical
Notes on the Lar-
ynx and Lungs.

In few words then, I would recall to your attention the fact, that the membranous bands within the larynx—called vocal cords—form the instrument which produces the human voice. We say “*cords*,” and I fancy that we are apt to think of these bands as very mechanical contrivances—violin strings or pipe-reeds—and to forget that they are living tissue, controlled by a fine adjustment of muscle, nerve, and blood-supply, and having, in their own substance, muscular fibres which vary their tension and change the pitch of tone. The air which sets these self-adjusting vocal bands in vibration passes through the lower part of the larynx, the trachea, and the entire length of those many tubes of varying size which constitute the bronchial system. The source of power is embodied in the chest and lungs, which are forcibly diminished in size by the expiratory muscles. Again we are apt to resort to comparisons, and to think of these complex structures as organ-bellows, drawing in air and pumping it out. But we are dealing with living, growing tissues, changing in their molecular elements every moment, changing in their gross structure as a result of every influence that tends to force them to perform their functions under abnormal conditions. It must be borne in mind, that the inflation of the chest is an effort made against a heavy weight of atmosphere; that, if this expansion is imperfect, and continues so during any prolonged period, the lungs, beneath, so change in structure, as to lose portions of their air-containing vesicles, like a sponge cramped into a space too small for its full expansion. This is especially liable to occur during childhood, while the walls of the chest are still undeveloped. The cause is, mainly, imperfect inspiration through the abnormally contracted passages of the nose and pharynx.

Resonating
Cavities.

Above the vocal bands, lie cavities which constitute “resonators.” These consist of the upper part of the larynx, the entire pharynx, and the cavities of the nose and mouth, arranged, as Landois remarks, in stories, as it were, the one over the other, each capable of being closed alternately. Again, we are not dealing with a sounding-box of wood, bone, or metal, but of living tissue, changing in shape with the development of the growing child, and subject to alterations by disease or abnormal use.

Briefly referring to the size of these resonating chambers, I would remind you how much of the skull they involve, a matter we are apt to forget in thinking only of the external nose.

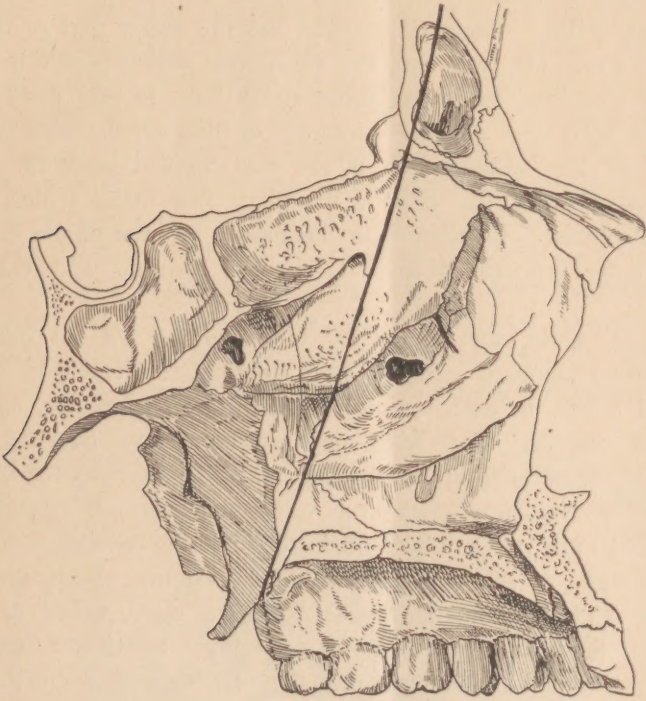


Fig. 1.

ROOF, FLOOR, AND OUTER WALL OF NASAL FOSSA.

The dark line indicates plane of triangle bisecting the nasal chambers. The dotted line indicates base line of this triangle.

The nasal chambers include spaces within the skull, whose anterior walls form about one-third of the face, exclusive of the lower jaw. These spaces might be included within the lines of a triangle whose much-rounded apex would cover the inner third of the superciliary ridges and inter-orbital space—the space just above the “root of the nose.” Its lateral arms would extend downwards, inwards, and backwards, and would join the extremities of the base-line, which would itself run through the junction of the hard and soft palate, and terminate immediately behind the third molar teeth. Posterior to the base-line, extends that important annex to these chambers, the *post-nasal space*. Above and behind the plane of this triangle, lie the posterior-superior half of the nasal air-passages, the sphenoidal sinus, and

two ethmoidal sinuses. The triangle would bisect the superior maxillary sinuses — those large, air-containing cavities beneath the face, opening into the nares. Its apex would bisect, also, the frontal sinuses, between and above the eyes. Below and in front of this imaginary triangle, lies the larger part of the anterior nares. Measured on the skull, the antero-posterior depth of this area is about three, three and a half, to four inches; extending from the external openings of the nares, back to the centre of the anterior arch of the first cervical vertebra. With the exception of the inferior maxillary and malar bones, every bone of the face, together with the basilar process of the occipital bone, enters into the formation of these tortuous and extensive areas.

General Structure of the Nares;
Soft Tissues.

Here, again, we are dealing with cavities not cut out from a common standard pattern, but differing, even within strictly normal limits, in each individual; and differing greatly, as a result of disease. The walls of thin bone are overlaid with mucous membrane, in whose substance lie myriads of glands, fine net-works of arteries and veins, and sensory branches of the great Fifth nerve which go in bewildering windings to unite with ganglia of the sympathetic nerve system. Such union of sensory and sympathetic nerves, leads to many series of reflex manifestations in regions of the respiratory tract, and upon the heart and blood-vessel system, often far remote from the limited area where irritation exists. We should wander far from our subject if we entered upon a description of such reflexes or upon the subject of the pathology of the upper respiratory tract, in general. This is not intended to be a medical address, yet, in presenting certain facts for your attention, I may be forced occasionally to give you suggestions of the hospital lecture hall.

Conditions causing Occlusion of Resonating Chambers.

Avoiding, then, any unnecessary attention to the normal or morbid anatomy of these parts, I would simply call your attention to some of the alterations which are found within the nares, post-nasal space, and pharynx. Later in my remarks, you will see that the conditions I am about to describe are very commonly found among the pupils who seek instruction in your schools. Let me assure you, that I shall limit myself strictly to these lesions and not bore you with others that are less commonly observed.

You have learned that the nares is divided into two chambers by a septum — bridge of the nose — extending through the

middle line of the skull for a distance of about two inches; that this structure is composed of bone and cartilage; that, in the outer walls of both nasal air-passages are found thin cushion-like, rounded masses, placed one above the other, and having a scroll-like, bony structure as their frame-work. The scroll-form has caused them to be named, *turbinated bodies*. Their soft structure consists of numerous mucous glands and blood-vessels in a bed of fibrous tissue. The blood-vessels communicate with certain enlargements similar in structure to the vessels themselves, vascular pouches or sacks, which can be filled quickly with blood, and from which, by contraction of their muscular and elastic walls, the blood can be, as quickly, driven back into the veins. Thus, by flushings and depletions of these vascular spaces, the outer walls of the nares swell and contract frequently during the day and night, coming sometimes in contact with the septum and thus partially or completely closing the air-passages.

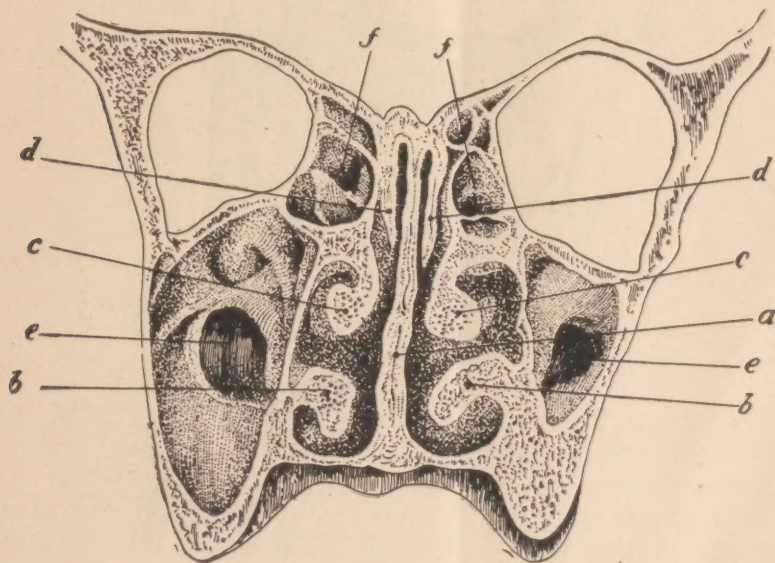


Fig. 2.

SECTION THROUGH THE NASAL CHAMBERS, SHOWING THE NASAL SEPTUM.

b, c, d, the lower, middle, and superior turbinated bodies; *a*, the nasal septum; *e*, the superior maxillary sinuses; *f*, the ethmoid sinuses. The septum is shown to be lacking in lateral support, being attached at base of skull and along floor of nose. [From Zuckerkandl.]

Like other parts of the respiratory passages, these turbinated bodies are covered with mucous membrane, and their glands secrete an enormous quantity of mucus which constantly moistens

the walls of the nasal chambers. As the air is inspired, it absorbs moisture from this mucous cavity, and thus goes down to the lungs charged with a certain amount of watery vapor, while, at the same time, it is heated to a temperature in keeping with the conditions necessary for that normal interchange of gases which occurs within the vesicular structure of the lungs.

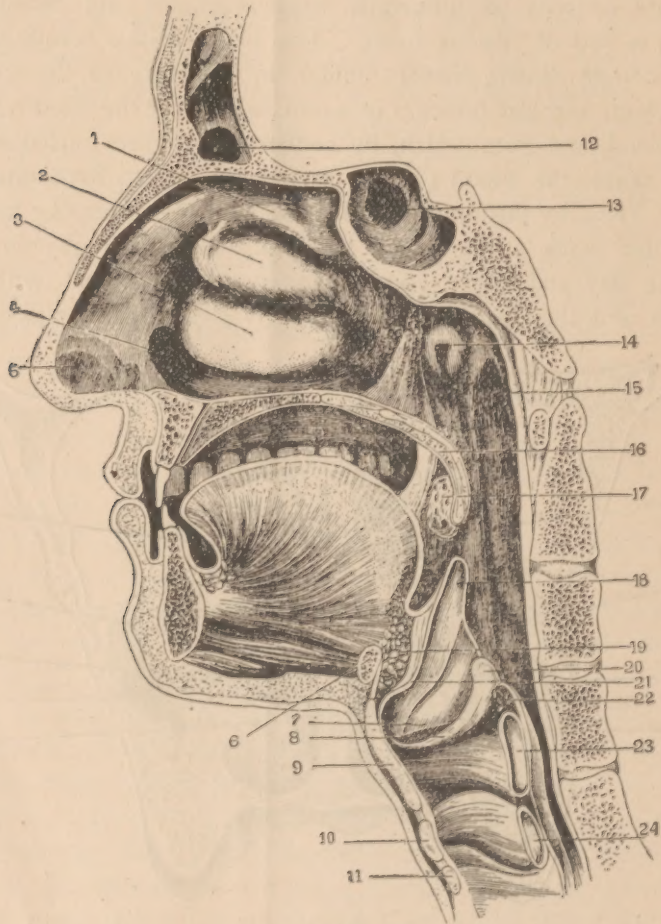


Fig. 3.

VERTICAL SECTION OF HEAD, SLIGHTLY DIAGRAMMATIC.

1. Superior turbinated bone. 2. Middle turbinated bone. 3. Lower turbinated bone. 4. Floor of nasal cavity. 5. Vestibule. 6. Section of hyoid bone. 7. Ventricular band. 8. Vocal cord. 9 and 23. Section of thyroid cartilage. 10 and 24. Section of cricoid cartilage. 11. Section of first tracheal ring. 12. Frontal sinus. 13. Sphenoidal cells. 14. Pharyngeal opening of eustachian tube. 15. Rosenmüller's groove. 16. Velum palati. 17. Tonsil. 18. Epiglottis. 19. Adipose tissue behind tongue. 20. Arytenoid cartilage. 21. Tubercle of epiglottis. 22. Section of arytenoid muscle. [From "*Diseases of the Throat*," Dr. Carl Seiler.]

Deprived of the moisture and heat, the atmospheric air becomes a source of irritation to the lungs, and aids in the development of pulmonary diseases. It is for this reason, that persistent occlusion of the nares, and, as a consequence, persistent mouth-breathing, is a grave source of danger to the health of the individual. Yet, again, must I avoid this important subject, and confine myself to occlusion of the nares as it affects voice-training.

As a result of prolonged inflammation, the turbinated bodies become permanently enlarged. Instead of shrinking down, so as to free the air-passage of the nose, they remain swollen and in contact with the septum on one or both sides. Such individuals appear to have a constant "cold in the head." Again, as a result of inflammation, they may become permanently shrunken, their glandular structure, in large degree, destroyed, and their mucous membrane covering changed to a harsh, dry, parchment-like envelope. Great variations in degree exist between these two extremes of overgrowth (hypertrophy) and of wasting (atrophy). Yet both tend to occlude the nose, the former by a fixed and swollen mass of tissue, the later, by dried and hardened masses of secretion.

Results of Inflammation on the Turbinated Bodies.

Another source of occlusion to the resonating chambers of the nose is found in displacements of the nasal septum. Such displacements are exceedingly common, but their consideration becomes of importance, only, when the bend of the bridge is so extensive as to impinge against one of the lateral walls of the nares, causing partial or complete occlusion. The septum of the nose is a thin partition wall dividing the nares into two equal parts. It is placed vertically to the floor of the nose, and extends from the tip of the nose back to the posterior border of the hard palate. It is composed of three elements, the vomer, a distinct bone, the vertical plate of the ethmoid bone, uniting with the vomer at about the central point of the latter's upper border, where the two long plates form a notch with wide acute angle, the "triangular notch." A somewhat triangular-shaped space is thus left which is filled in, so as to complete the full extent of the septum, by a large fibro-cartilaginous plate, called the "triangular cartilage." This cartilage extends beyond the plane of the face, and forms the partition-wall of the two nostrils. The relatively large, flat, thin surface of the septum, thus composed of three distinct parts, has no lateral support (see Fig. 2), but is fixed above, along the base of the skull,

Displacement of Nasal Septum as a source of Occlusion.

Description of Nasal Septum.

Causes of Sep-
tal Deformity;
Errors of Devel-
opment.

and below, along the floor of the nose. Its development begins very early in embryonic life—about the fourth week—but the complete union of all its parts does not occur until about the twelfth year of life. During these twelve years, the skull is undergoing constant change. The rates of development at the base of the skull and about the upper jaw may not be in proportion to each other; and, thus, the bridge, still incomplete, may be subjected to varying degrees of stress and pressure from above or below, without having any lateral support. As a result, it may be sprung to one side, in accordance with the direction of this stress and the lines of least resistance. Thus, it may assume a curve whose degree may be so decided, as to produce one large open naris, while the other one is small or quite occluded.

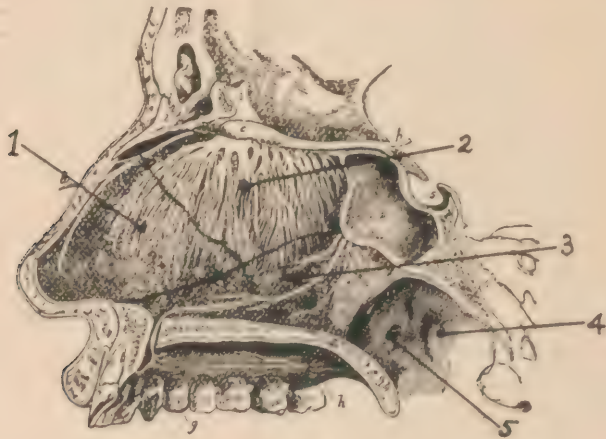


Fig. 4.

ELEMENTS OF NASAL SEPTUM.

1. Triangular cartilage. 2. Vertical plate of ethmoid bone. 3. Vomer, 4. Opening of right eustachian tube. 5. Posterior nares.

A more common cause for serious deflections of the septum, however, results from the frequent injuries inflicted upon this prominent feature during the years of childhood. Without regard to sex or social condition; whether the child is a studious, sedentary, little recluse, or a boxer, base-ball player, and destroyer of his anxious mother's peace of mind, the poor nose is bound to suffer, and to come into more or less violent contact with the hard, unsympathetic world. So, fractures of the cartilaginous portion, or partial displacements of the same from its bony partners in this septal compact, are not uncommon. Such

injury may cause immediate deformity, or may modify the normal growth of the parts, so that the crookedness increases with the child's growth, and occlusion of one or both sides gradually develops. We must remember, too, that this comparatively mechanical defect results in more serious conditions when associated—as it so frequently is—with that enlargement of the turbinated bodies to which I have already called your attention. Another cause of occlusion to the nasal chambers is the presence of an overgrown glandular mass in the posterior nares. This mass has much resemblance in structure to the faucial tonsils, and is technically called, an overgrowth of the normal adenoid tissue of the naso-pharynx, or, for short, an “adenoid.” Dr. Harrison Allen, in his lecture in 1892, went so fully and ably into the description of this overgrowth, describing its evil effects upon the physical and mental development of the child, that it will be quite unnecessary for me to dwell upon these subjects. I would simply warn you not to regard this mass as in any way a tumor, or new formation, but, simply, as an overgrowth of tissue in itself quite normal to this space; an overgrowth similar to that which the tonsils may at times assume. Like the tonsils, however, when thus enlarged beyond natural limits, it becomes a grave source of danger to the health of the child. Here, again, our field broadens out, far away from the limits of my subject, and I must keep to the narrow road we have chosen to follow. In passing, however, let me simply remind you that the lower openings of the eustachian tubes are in the lateral walls of this posterior nasal space (see Fig. 3); that these tubes must be free to allow passage of air up into the middle ear; that the common cause of the most common form of ear trouble, which has produced the deafness of your pupils, is closure of these tubes, or the ingress of inflammation through them into the middle ear. Such occlusion results most frequently from the pressure of overgrown adenoid masses, from the permanent enlargement of turbinated bodies, or from permanent contact of turbinated bodies with the nasal septum. Let me remind you, too, that the lining membranes of these eustachian tubes, of the middle ear itself, and of the nasal chambers, and the pharynx, is continuous and common in its structure, and, that catarrhal disease of these chambers readily extends along these passages into the middle ear. Inflammation of the middle ear has, in by far the majority of instances,

Post-nasal
“Adenoids” as a
source of Occlu-
sion, etc. ...

Relation of
Post-nasal “Aden-
oids” to Pro-
duction of Aural
Diseases; also
of Nasal Deformi-
ties and of Catar-
rhal Inflamma-
tion, in relation
to Aural Diseases.

been preceded by inflammation within the tracts which we have so briefly, and, I fear, imperfectly reviewed. While speaking of enlargement or overgrowth of the adenoid tissue of the nasopharynx, I referred to the resemblance of this tissue to that forming the tonsils. I would now direct your attention to the tonsils themselves, as being another of the agents which may cause partial occlusion of the upper respiratory tract, and imperfect phonation.

The Faucial
Tonsils as being
Causes of Occlu-
sion.

The normal tonsils are small, glandular structures, placed one on either side of the pharynx, between the anterior and posterior pillars of the fauces. These "pillars of the fauces," so called, you probably remember, are not columns to hold up the soft palate, as their names would imply. In reality, the pillars of the fauces are two sets of fibrous bands, one on either side of the pharynx, extending from the soft palate downwards and outwards; the forward one being attached, at its lower end, to the sides of the tongue, near the base of this member, the back one uniting with the tissues in the lateral wall of the pharynx. They are muscular structures, the forward one being named the *palato-glossal* muscle, the posterior one being called, the *palato-pharyngeal* muscle. Their situation, in relation to one another, produces a triangular space with the apex upward, at the junction of the uvula and soft palate. Within these triangular spaces, one on either side of the fauces, lie the tonsils, and, normally, the upper margins of these latter bodies should not extend above a line carried at right angles across the upper surface of the tongue, where it lies below the soft palate. They should not extend beyond the free margins of the faucial pillars, and should not, in normal conditions, be attached to these bands, both of which, during movements of the palate, should glide smoothly over them. In short, the tonsils should not press upwards against the soft palate or outwards against the sides of the tongue. Within the limits I have stated, there is much freedom allowed for variations in size quite within the normal. A healthy tonsil which is simply large, but which does not interfere with the movements of the palate or of the tongue, need not be considered. If it does produce this interference, it has, also, become large enough to cause partial occlusion of the faucial space, and interferes, also, with normal respiration and deglutition. A tonsil enlarged to this extent is rarely normal

in structure, and as a rule, readily undergoes inflammation, as shown by attacks of Quinsy, Pharyngitis, or, fortunately rarely, Diphtheria.

The tonsils have no function in phonation. Their physiology is obscure, the more recent theories being, that they are blood-forming glands. They have been classified among the producers of Leucocytes, or the peculiar white-cell, found in the blood and in the lymphatic system, which afterwards changes into the red blood-corpuscle. Quoting from an article by G. G. Lovell, on the function of the tonsils, we learn, that "the newly formed leucocytes remain partly in the lymph vessels, thus remaining partly in the tonsils, as stationary cells, or, in part, emigrate upon the surface, passing through the epithelium." Thus, a protective wall of leucocytes is formed, that stands upon the battlements of these two fortresses, one on either side of that narrow strait which guards the passages to the digestive and respiratory tracts. These little cells, thus, it is claimed, act as warriors, to attack the invading armies of microbes entering with the food or air. Many are slain in this constant warfare, but others, born within the fortress, viz, within the lymph-spaces of the tonsils, rush to fill up the broken ranks, and fight on where the banners hang upon the outer walls. It is an attractive theory and possesses a strongly dramatic interest. Although not strictly proven, it cannot be denied. Much in the study of that minute life within and around us tends to suggest, that such warfare may be in constant progress between these little, individual cells, each with a life-history of its own, which, in time, go to form elements in the blood, muscle, bone, or nerve of their human bearer, and that great, varied mass of micro-organisms which are foreign to the body but which are around us and within us during all our lives, and among which are the carriers of deadly diseases, whose ingress and lodgment within our bodies mean sickness and even death. Again we are attracted to wide fields of discussion, but must return to—our *tonsils*. Whatever may be the function of these structures, their presence, when abnormal in size or when actively diseased, becomes injurious to the general health of the individual thus afflicted, and interferes seriously with the action of the tongue and soft palate. Together with the enlargements of the post-nasal adenoid tissue, both of which conditions commonly exist together, they narrow the air-passages, force the subject to

breathe through the mouth instead of through the nose, and thus tend to produce those deformities of the chest and imperfect development of the child, which Dr. Harrison Allen so fully described to you two years ago.

We are fast coming to the practical application of these dry facts which, I fear, have bored you all terribly, but to which you have listened with a remarkable degree of patience. Before touching upon the subject of what has been found by others and by myself among deaf-mute pupils, as a result of examinations of the nose and throat and ear, let me guard you against placing undue importance to all lesions. To understand the deformities about to be described, you must have some intelligent conception of the parts involved, and of certain gross changes which they undergo as a result of disease. This has been my excuse for taking you on a dreary pilgrimage over the desert of pathological anatomy. I place confidence in the pluck, endurance, and long-suffering of my audience; and, as yet, you have not risen up against me with the cry, "Hold! Enough! Away with him!"

Care must be observed in considering conditions not strictly normal, lest we exaggerate the importance of conditions not in themselves serious.

Distinctions in regard to Abnormalities within the Nares—Turbinated Bodies.

Lest my words should have a tendency to place the deaf-mute child before you too much in the light of a wretched subject of disease, let me hasten to prune down any exaggerated ideas that may have formed in your minds. I must, also, ask you to recall this explanation while I am reviewing the lesions which have been found commonly among deaf-mutes. And, first, in regard to abnormal conditions within the nares. Enlargement of the turbinated bodies is a very common condition. To a certain degree, it is found in many individuals who are totally ignorant of its existence, as they are not conscious of any interference with the normal activity of the parts. It is of importance when the overgrowth causes occlusion to the passages, or has increased to such a degree as to press against the septum. Shrinkage of the turbinated tissue, to a certain extent, is also a very common condition, but becomes of importance, when, as a result of this sclerosing or hardening process, the glandular element of the mucous membrane is greatly destroyed and its epithelial covering so altered, that the membrane itself loses its true character and is converted, more or less, into a dry, skin-like covering.

Septal Deformities—when important.

Twists and bends and even fracture of the bridge, as we have noted already, are exceedingly common. They deserve

attention only when causing occlusion to one or both nares or contact and pressure at points between the septum and the outer nasal walls.

The presence of a certain amount of adenoid tissue in the vault of the pharynx is entirely normal. Its overgrowth, causing pressure on the floor of the soft palate, pressure against the eustachian openings, excess of secretion, and nasal occlusion, are conditions which demand attention. Tonsils that are simply large, but whose structure is entirely normal, and which in no way interfere with the action of neighboring tissues, need not be looked at twice. However, when you examine a pharynx and see two large, rounded, India-rubber-like balls, that project far out from the sides of the throat—perhaps almost touching in the median line—which press on the sides and base of tongue, and which press upwards against the palate, what is the use of trying to make the deaf-mute thus accoutered, talk? It seems to me, that you might as well make the attempt on one whose tongue has been gagged and whose mouth you have stuffed with putty. Such a condition of hypertrophy is most frequently made worse by the existence, also, of enlarged “adenoids” in the vault of the pharynx.

“Adenoids”—normal and the reverse.

Tonsils which demand attention.

The subject of overgrowth of lymphoid tissue in the throat and posterior nares is a large one, and we cannot enter upon it. There is much similarity in structure and in development, and, probably also, in function, between the different elements that go to form that ring of lymphoid tissue which surrounds the entrance of the respiratory and digestive tracts. Starting at the base of the tongue, where it lies between that organ and the epiglottis, its lateral parts are formed by the faucial tonsils, its upper arch by the adenoid mass of the posterior nasal space. Owing to causes which seem to influence the entire growth of the individual, these lymphoid structures outgrow their natural size, and, as a result, soon take on conditions of disease. We say such individuals are *strumous*, *scrofulous*, etc. They are apt to be pale, with flabby tissues, poor digestion, generally weak physique, and with certain defects in the skeleton, which modify the shape of the bones and joints and of the frame-work of the chest.

Lymphoid tissue of the Upper Respiratory Tract.

Dr. Allen has referred fully to the relation which occlusion to the respiratory tract, by reason of these lymphoid enlargements, bears to the development of the mental and physical states

of children of this type. I refer, only, to the interference which these enlargements must have in your work as teachers of the oral system. It is not my place, here, nor would it be regarded by my medical brethren as in any way proper, that I should now go into the details of treatment, and lecture to you of instruments and drugs and their uses. This, I shall not do; yet, I cannot leave this subject of hypertrophied tonsils and enlarged posterior nasal "adenoids," without asking you to keep your minds free from old-time prejudices regarding the removal of these occluding masses. Whatever the function of these parts may be when normal, their removal, in states of overgrowth and disease, has too often resulted in improvement of the child's speech—I say nothing of the marked improvement in the general health—to persuade us that they should be retained for the sake of any good they may accomplish. The danger attending removal has been greatly exaggerated. The operation is done, now, so commonly, that its proper technique is well understood. Instances of dangerous hemorrhage have occurred in cases, only, where total extirpation of the tonsils has been attempted. This is unnecessary. The same fact is true of the post-nasal adenoids. When properly operated upon, I cannot see how a fatal or even alarming hemorrhage can possibly attend their removal. These masses do not "*recur*," or reappear, and the good results following their removal are most marked—in regard to the patient's general health, in that normal respiration is effected; in regard to vocalization, by causing the release of tongue and palate from pressure. As you may know, the presence of enlarged tonsils and post-nasal adenoids causes the voice to be dull, dead in tone, utterly without resonance, the voice of an individual suffering, at once, from "cold in the head" and sore throat. In the formation of vocal sounds, the parts attempt to perform their function, in spite of the disadvantages under which they labor. The ordinary child has the aid of its sense of hearing and can approximate the normal tones. Nature always does her best, even with imperfect machinery, and by many modifications of movement, the various organs of speech in such individuals perform their functions. But, in the deaf-mute, thus burdened, the chances for gaining speech are greatly lessened. The jaws, themselves, are altered. The face of such a child resembles, in a degree, that of a fish out of water. The mouth is depressed at the angles and is open. The upper lip and cheek, falling heavily

Importance of removal of diseased and Occluding Tonsils, and "Adenoids," especially in the case of Oral-pupils.

Malformations of the Mouth and Jaws resulting from Mouth-breathing caused by presence of Enlarged Tonsils and "Adenoids."

against the sides of the upper jaw, press these parts together, so that the hard palate is narrowed, being compressed into the form of a high Gothic arch. By reason of this lateral pressure, also, the front teeth are crowded together; the upper incisors, forced together into a projecting angle, instead of the usual half arch, tend, also, to face with their cutting-edges outwards; the lower incisors fail to touch them, or, if contact occurs, their edges touch the inner surfaces of the upper incisors far behind the latter's cutting-edges. Thus the upper jaw is narrowed and lengthened while the palate is narrowed, and changed from a low dome-shape to the high angular arch. The child is constantly *gulping*, as though swallowing air, especially in attempting to speak. In reality it is freeing the pharynx and post-nasal space from the excessive secretion of mucus, with which such cases are burdened. You know the various shapes which the oral-cavity assumes, in forming the vocal sounds. How can a mouth, so deformed, arrange itself into the proper position, especially when the pupil's eye, alone, can be the guide, or at most, his sense of touch? With great difficulty can a mouth, so deformed, widen its horizontal and vertical diameters, or vary its depth, as must be done in forming the various vowel sounds. Much less easily can the consonants be produced, demanding free play of tongue, at its base and tip, and of palate.

Difficult for such children to articulate properly.

But, you will say, "this sad, melancholy, and fish-faced mute, which you have so heartlessly described, is an extreme case; we seldom meet with him in the class-room!" But I have met him in the examining-room, after he has passed from the oral class down to the manual school, branded as an "*oral failure*."

I do not wonder at the failure! I wonder at the hopefulness of the teachers who attempted to teach him vocalization with vocal organs thus shackled. My case is not an extreme one. It reappears again and again, varying not so greatly in degree. The tonsils may be slightly swollen, the nasal chambers somewhat freer, than in the individual we have pictured, but the results of training will be very similar, or but a few degrees better. Among your pupils whom you count as successes, are very many whose articulation would be far better, if the mechanical obstructions, caused by the conditions which I have mentioned, had been removed before oral training had been commenced. Perhaps benefit might follow removal of such obstructing

masses even at a later period; yet, pupils learn certain tricks in articulation, often forced upon them by the existence of deformities, which remain after these latter have been corrected. Treatment for such conditions should be resorted to, early, for another reason. That is, because the malformations of the upper jaw, involving the alveolar process and palate, are formed in early childhood, before the bones of the face have entirely completed their development. Mouth-breathing should be overcome during the early stages of this period. So much for this part of our subject.

Defects of the
Mucous Mem-
branes of Nares
and Pharynx—
when important.

In regard to certain defects of the mucous membrane, which I shall mention, namely, Sclerosis, Hypertrophy, Engorgement, or passive congestion, let me say, that these various conditions are exceedingly common among all classes of people in this country. The laity classify them all into one variety of disease, to which they give the general name, "*Catarrh*." Of course, such generalization means nothing, yet you will recognize this one mysterious and awe-inspiring word, as associating itself in your minds with many wood-cuts of ladies and gentlemen, which have adorned the advertisement columns of your secular and, even, religious newspaper; while, beneath the portrait, will be described, in harrowing detail, the dreadful sufferings of the original from "*Catarrh*;" and yet, how a helpless and healthless existence has been changed to a paradise of perfect health by the use of Dr. So and So's "*Catarrh Remedy*." Now, you will find in my report of cases, that inflammatory conditions of the membranes lining the pharynx, naso-pharynx, and nares, are quite common among deaf-mutes. But I must warn you, that, in this country, very few individuals, otherwise in perfect health, are entirely free from the less serious forms of nasal or pharyngeal catarrh. Comparatively few, however, are sufficiently inconvenienced by symptoms, to require medical treatment. So you will perceive, that, in examinations of the noses, throats, and ears of deaf-mutes, we must bear in mind, that divergences from the normal are common to large classes of individuals, and it has been my aim to take note of such lesions, only, as they interfere decidedly with the functions of the parts they involve.

LECTURE II.

In his able lecture of two years ago, Dr. Harrison Allen called attention to some examinations upon the noses, throats, and ears of pupils in the Pennsylvania Institution for the Deaf and Dumb. Since Dr. Allen referred to those cases, the report of this examination has been published and some of my hearers may have read it. I regret, that a carefully tabulated and detailed report of the work, which was sent to the Volta Bureau, has never been printed. The mere enumeration of lesions is of considerable interest, but a matter of still more interest and importance is the record of the associated conditions in each case. The reader becomes, thus, the examiner for himself. The detailed report placed each case in this point of view.

I desire, now that we have reviewed in a very general way, the common forms of deflection from the normal, which may influence vocalization, by mechanical obstruction, closure of resonating cavities, and interference with normal respiration, to take up these examinations conducted at the Pennsylvania Institution, and to add to its list of cases others that have been collected from similar observations in other schools. As my hearers probably know, the pupils of the Pennsylvania Institution are taught by oral and manual methods. Formerly, it was left to the judgment of the teachers or guardians of the children, by which system the pupil should be trained. It is the rule now, to place every new pupil in the oral department, where he or she is given a thorough trial. Since the oral school was started, several years ago, there have been frequent instances where the teachers have been unable to accomplish satisfactory results, and pupils thus failing to acquire vocalization, have been sent to the manual department, their oral training being considered a failure. Thus there has been developed a class of pupils whom we may call *oral failures*. It is to this class that I desire to direct your attention most especially. The most common serious affections of the upper respiratory tract found among these pupils were located in the post-nasal space and pharynx. Next in importance, were occlusions of the nares by contact between hypertrophied turbinated bodies and septa, or by exostoses from the latter, in contact with enlarged, or occasionally, with atrophied turbinates.

The almost constant condition of the vocal cords was weakness of the crico-thyroid and thyro-arytenoid muscles. The adduction and abduction movements of respiration were normal,

The Examinations at the Pennsylvania Institution, in regard to Nares, Post-nares, Throat and Ears; 415 pupils.

but the vocal cords were thin, grayish in color, relaxed, and manifested a weak degree of tension. Such was the case among the 303 pupils of this school, who had been instructed in the sign-language, only. There were 91 pupils who were receiving training in the oral department. Among these were found conditions of the nares and pharynx which corresponded in character and in ratio of frequency with those observed in the sign-language pupils. The vocal cords, however, approached more nearly the normal condition, especially among the older oral pupils. The most interesting and important observations, however, were found among a group of 21 pupils who had failed to acquire the oral method of speech, and had been sent to the sign-language department as *oral failures*. Among these 21 pupils the abnormalities in the parts found so commonly diseased in the cases of the entire 415 pupils, were in greater ratio than in the other two groups. Thus: deformities, consisting of deviated septa, exostoses, hypertrophied turbinates, causing partial or complete occlusion of one or both nares, were found—

among 303 "signers"	in 65 pupils.
" 91 "orals"	" 14 "
" 21 oral-failures	" 5 "

Posterior hypertrophies of the turbinates were found—

among 303 "signers"	in 21 pupils.
" 91 "orals"	" 1 "
" 21 oral-failures	" 2 "

Adenoid tissue in the vault of the pharynx, causing partial occlusion of this space or pressure upon the eustachian opening, was found—

among 303 "signers"	in 57 pupils.
" 91 "orals"	" 14 "
" 21 oral-failures	" 7 "

Large tonsils, which filled the space between the faucial pillars of their own sides of the throat, or were greatly hypertrophied and diseased, causing pressure on palate or tongue and greatly occluding the faucial space, were found—

among 303 "signers"	in 50 pupils.
" 91 "orals"	" 21 "
" 21 oral-failures	" 5 "

Adhesions between tonsils and faucial pillars, the tonsils being encapsulated, were found—among 303 "signers" in 30 pupils.

" 91 "orals"	" 6 "
" 21 oral-failures	" 5 "

Abnormal states of the pharyngeal mucous membrane, consisting of simple follicular hypertrophy, sclerosis with follicular hypertrophy, simple sclerosis, atrophy, or venous engorgement, were found—

	among 303 "signers"	in 117 pupils.
"	91 "orals"	32 "
"	21 oral-failures	9 "

The vocal bands were, apparently, normal in color and ordinary movement,—

	among 303 "signers"	in 83 pupils.
"	91 "orals"	63 "
"	21 oral-failures	12 "

Thus, it will be seen, that the 21 pupils who failed to acquire the oral method, labored under the disadvantages of abnormal vocal organs, in by far greater percentage than existed among the successful oral pupils. But these latter, also, show numerous instances of abnormal conditions. The question of what influence the lesions, which have been enumerated, have upon the general health and mental development of children, is now well understood. It is merely necessary to suggest, that, in many instances, treatment for the relief of these conditions among the 303 sign-language pupils was demanded on such general grounds. But, with the oral pupils, the matter is of even more vital importance: for the occluded nares, stuffed post-nasal spaces, fauces narrowed by enlarged tonsils, pressing, also, upon palate and tongue, must offer great, at times, almost insurmountable difficulties, in the successful training of the oral pupil. The oral method is destined to be employed more and more completely in the schools of this country, as it has been, for a long time, in the deaf-mute institutions of Europe. Such being the case, the importance of a thorough examination of the upper respiratory tract, in all pupils about to undertake this training, is quite manifest. The removal of these mechanical difficulties will save many pupils from complete failure, while the stuffy, imperfect phonation, heard so frequently among "Orals" counted as successful, will be less common than at present.

Since the examination of the 415 pupils, forming my first series of cases, two classes have been admitted to the Pennsylvania Institution. All new pupils are, now, received in the oral department, so that a fair opportunity is given to every pupil to acquire vocalization. I would refer very briefly to the results of my examinations upon the members of these new

Examination of 106 additional Pupils, at the Pennsylvania Institution, making 521 pupils in both series of examinations.

classes. The pupils numbered, in all, 106. The conditions found within the upper respiratory tract correspond with those already recorded. The division into "signers," "orals," and "oral-failures," fortunately, no longer holds. These pupils are all "orals," and I understand that their teachers do not propose to have any "failures." The findings from the examination of these 106 pupils is as follows:—

1. Pupils whose respiratory tracts appear to be quite normal,.....	26
2. Deflections of the nasal septum, causing partial or complete occlusion,...	10
3. Hypertrophied turbinates,.....	6
4. Exostoses from the septum, with deflection,.....	1
5. Atrophic catarrh of nares,.....	4
6. Synechial bands, causing adhesion between the septum and turbinates,...	1
7. Hypertrophied adenoid tissue in the post-nasal space,.....	17
8. Large tonsils,.....	12
9. Encapsulated tonsils,.....	2
10. Hypertrophied tonsils showing evidence of an inflammatory process,.....	10

EARS.

1. Foreign bodies,.....	2
2. Varying degrees of adhesion and sclerosis, classified under the general term, Plastic Otitis,.....	34
3. Chronic purulent inflammation of the middle ear,.....	8
4. Perforations of the drum-head which have undergone cicatrization,.....	2
5. Impacted cerumen,.....	11

I wish to call your attention to the interesting report of Dr. James Kerr Love, aurist of the Glasgow Institution for the Education of the Deaf. 175 pupils were examined and the lesions in nares, posterior nares, pharynx and the ears, recorded. The findings correspond quite fully with my own 512 cases. This fact is of interest, as these series of examinations were made in two separate institutions, one in Scotland, the other in Pennsylvania. Dr. Love is, apparently, quite ignorant of my own work, so cannot have been an imitator of my methods. My first series of cases were reported before he had commenced, or completed, his own report. It is the more interesting, therefore, that we should have, both of us, found the lesions within the respiratory tract of deaf-mutes, to be much the same in two countries which differ so decidedly in climate as do Scotland and our eastern Middle States.

In order to illustrate more fully the importance of these abnormalities, I have copied the notes of the 21 oral failures from my note-book. The great amount of time and space required, will prevent me from detailing cases from the other two

Examination
by Dr. James Kerr
Love at the Glas-
gow Institution
for the Education
of the Deaf; 175
pupils.

groups of pupils. In making these notes, I have stated simply the appearances observed, without any attempt to exaggerate the importance of lesions. Conditions stated as normal, might in some instances, be counted the reverse. But it must be considered, that, in this country, we can seldom find instances of perfect normality in nares, post-nasal space, or pharynx. In drawing distinctions between the normal and the abnormal, I have placed in the latter category such conditions as appeared to interfere more or less with the functions of the parts involved.

CASE I.

L. K. Aged 21 years; male.

Deaf. Since 2 years old.

Cause. Spotted fever.

Family. Parents not related; no deaf-mute relatives.

Anterior nares. Fracture of septum, separating the triangular cartilage from the vomer, and deflecting it to the right, so as to occlude the right nares. Mucous membrane is much sclerosed.

Posterior nares. End of left lower turbinate is greatly hypertrophied, and almost occludes the left choana.

Tongue. Normal.

Palate. High, rounded.

Pharynx. Mucous membrane is sclerotic. The tonsils adhere by bands to the pillars of the fauces.

Larynx. Vocal cords hyperæmic; tension not very good.

Voice "nasal" but fairly clear.

Ears. The drumheads are retracted; feebly movable.

CASE II.

J. G. Aged 19 years; male.

Deaf. Since birth.

Cause. Unknown.

Family. Parents are not related; no deaf-mute relatives.

Anterior nares. Mucous membrane is dry; the middle turbinates are covered with dried secretion.

Posterior nares. An injected vessel is seen in the anterior lip of each eustachian opening. The adenoid tissue in vault is enlarged, but does not appear to cause occlusion.

Tongue. Normal.

Palate. High, and narrow.

Pharynx. Normal.

Larynx. Vocal cords hyperæmic; voice is fairly clear.

Detailed report of the Examination at the Pennsylvania Institution, on 21 Pupils who had failed to acquire vocalization and had been sent to the Manual Department, as being, "Oral-failures."

Ears. Left. Drumhead is retracted; is movable, except the manubrium, which is adherent. There is a cicatrix in center of drumhead, posterior half.

Right. Drumhead retracted, movable; scar in centre.

Hearing. Trace of hearing by bone-conduction.

CASE III.

G. D. Aged 16 years; male.

Deaf. Since 4 years old.

Cause. Scarlet fever.

Family. Parents not related; no deaf-mute relatives.

Anterior nares. Normal.

Posterior nares. A large mass of enlarged adenoid tissue in centre of vault; not occluding.

Tongue. Normal.

Palate. Normal.

Pharynx. Normal.

Larynx. Normal.

Ears. Left. Canal closed by impaction of cerumen.

Right. Canal filled with cheesy, foul-smelling pus.

CASE IV.

H. R. Aged 15 years; male.

Deaf. Since birth.

Cause. Unknown.

Family. Parents not related; two brothers, and many other relatives are deaf-mutes.

Anterior nares. The right lower turbinate is enlarged and is in contact with the septum. The floor of nares, on either side of the anterior nasal spine of superior maxilla is abnormally high.

Posterior nares. Mucous membrane is sclerotic.

Tongue. Normal.

Palate. Normal.

Pharynx. The right tonsil is much enlarged, filling space between its faucial pillars, and projecting into the fauces.

Larynx. Vocal cords show a fair degree of tension.

Ears. Left. Large scar at end of manubrium; drumhead much retracted.

Right. Drumhead is thickened; feebly movable.

Hearing. Trace of hearing by bone-conduction.

CASE V.

L. E. Aged 16 years; female.

Deaf. Since birth.

Cause. Unknown.

Family. Parents not related; no deaf-mute relatives.

Anterior nares. Normal.

Posterior nares. Vault is nodular and irregular by reason of adenoid masses; not occluding.

Tongue. Normal.

Palate. Normal.

Pharynx. Very irregular, lumpy posterior wall, the mucous follicles being much enlarged; mucous membrane of soft palate shows much venous engorgement.

Larynx. Vocal cords hyperæmic; fairly good tension.

Ears. Drumheads are large, thin, retracted, movable.

Hearing. Trace of hearing by bone-conduction.

CASE VI.

H. Z. Aged 15 years; female.

Deaf. Since birth.

Cause. Unknown.

Family. Parents are deaf-mutes (congenital); one brother, two sisters and many relatives are deaf-mutes. Mother has one sister and four brothers who are deaf-mutes; father has one sister, a deaf-mute.

Anterior nares. Normal.

Posterior nares. Normal.

Tongue. Normal.

Palate. Normal.

Pharynx. Tonsils are nodular and fill spaces between their faucial pillars; do not occlude the faucial space.

Larynx. Vocal cords; gray, thin, apparently good tension.

Ears. Left. Drumhead slightly retracted.

Right. Drumhead has good lustre, is retracted; very feebly movable.

Hearing. Trace of hearing by bone-conduction.

CASE VII.

E. F. Aged 15 years; female.

Deaf. Since birth.

Cause. Unknown.

Family. Parents not related; has one brother who is a deaf-mute.

Anterior nares. Spur from vomer, centre, not in contact with septum.

Posterior nares. Normal.

Tongue. Normal.

Palate. Normal.

Pharynx. Normal.

Larynx. Normal.

Ears. Drumheads greatly retracted, immovable.

Hearing. Trace of hearing by bone-conduction.

CASE VIII.

E. L. Aged 14 years; female.

Deaf. Since 4 years old.

Cause. Scarlet fever.

Family. Parents not related; no deaf-mute relatives.

Anterior nares. Large lower turbinates, not in contact with septum.

Posterior nares. Mass of enlarged adenoids in centre of vault.

Tongue. Normal.

Palate. Normal.

Pharynx. Normal.

Larynx. Normal.

Ears. Drumheads both destroyed; otorrhœa from both ears.

CASE IX.

J. S. Aged 16 years; male.

Deaf. Since one year old.

Cause. Scarlet fever.

Family. One brother and one sister are deaf-mutes. The parents are not related; father has several deaf-mute relatives.

Anterior nares. Mucous membrane is sclerotic.

Posterior nares. Contains much thick mucus.

Tongue. Normal.

Palate. Normal.

Pharynx. Venous engorgement.

Larynx. An unusually dependent epiglottis, greatly rounded, with pointed end. Vocal cords could not be seen.

Ears. Large drumheads, good lustre, movable.

Hearing. Trace of hearing by bone-conduction.

CASE X.

H. T. Aged 16 years; male.

Deaf. Since two and a half years old.

Cause. Scarlet fever.

Family. Parents not related; no deaf-mutes.

Anterior nares. Normal.

Posterior nares. Normal.

Tongue. Normal.

Palate. Normal.

Pharynx. Mucous membrane is sclerotic; tonsils are encapsulated.

Larynx. Normal.

Ears. Perforations in drumheads.

CASE XI.

J. F. Aged 14 years; male.

Deaf. Since birth.

Cause. Unknown.

Family. Parents not related; one sister is a deaf-mute.

Anterior nares. Normal.

Posterior nares. Normal.

Tongue. Normal.

Pharynx. Mucous membrane of posterior wall is atrophic.

Larynx. Vocal cords slightly hyperæmic.

Ears. Drumheads are retracted, feebly movable.

Hearing. Trace of hearing by bone-conduction.

CASE XII.

J. K. Aged 12 years; male.

Deaf. Since one and a half years old.

Cause. Measles.

Family. Parents are not related; no deaf-mute relatives.

Anterior nares. Mucous membrane is sclerotic.

Posterior nares. Normal.

Tongue. Normal.

Palate. Left half-arch is slightly higher than the right one.

Pharynx. Normal.

Larynx. Normal.

Ears. Destruction of both drumheads; otorrhœa.

Hearing. Trace of hearing by bone-conduction.

CASE XIII.

J. McE. Aged 17 years; male.

Deaf. Since seven years old (?).

Cause. Sickness (?).

Family. Parents not related (?), no deaf-mute relatives.

Anterior nares. Septum is deflected to left, not occluding.

Posterior nares. Normal.

Tongue. Normal.

Palate. Normal.

Pharynx. Tonsils fill the spaces between their faucial pillars, are encapsulated and adhere to faucial pillars, thus greatly narrowing the fauces, which is still more obstructed by the very large uvula.

Larynx. Normal.

Ears. Drumheads are normal in appearance; feebly movable.

CASE XIV.

M. F. Aged 17 years; female.

Deaf. Since 2 years old.

Cause. Sickness (?).

Family. Parents not related. Three other children in this family are deaf-mutes.

Anterior nares. Normal.

Posterior nares. Normal.

Tongue. Normal.

Palate. Normal.

Pharynx. Venous engorgement of mucous membrane.

Larynx. Vocal cords hyperæmic.

Ears. Impacted cerumen in both auditory canals.

Hearing. Trace of hearing by air and bone-conduction.

CASE XV.

L. W. Aged 11 years; female.

Deaf. Since birth.

Cause. Unknown.

Family. Parents not related; no deaf-mute relatives.

Anterior nares. Normal.

Posterior nares. Considerable adenoid tissue in vault.

Tongue. Normal.

Palate. Normal.

Pharynx. Posterior wall rendered very irregular and lumpy by masses of enlarged mucous follicles. Tonsils are large, but soft, and do not occlude the fauces.

Larynx. Vocal cords are relaxed; poor tension.

Ears. Drumheads are much retracted.

CASE XVI.

A. S. Aged 12 years; male.

Deaf. Since birth.

Cause. Unknown.

Family. Parents are cousins; no deaf-mute relatives.

Anterior nares. Mucous membrane is sclerotic and is covered with much thick mucus.

Posterior nares. Large amount of adenoid tissue.

Tongue. Normal.

Palate. Normal.

Pharynx. Enormously enlarged tonsils, filling the faucial space, almost in contact with one another; encapsulated and nodular.

Larynx. Vocal cords show a poor degree of tension.

Ears. Drumheads are much retracted; dull in color.

CASE XVII.

J. Z. Aged 17 years; female.

Deaf. Since birth.

Cause. Unknown.

Family. Parents are not related; are both deaf-mutes; 2 sisters, 1 brother, aunts, uncles and cousins are deaf-mutes.

Anterior nares. Hypertrophy of left lower turbinate.

Posterior nares. Normal.

Tongue. Normal.

Palate. Normal.

Pharynx. Normal.

Larynx. Vocal cords relaxed; poor degree of tension.

Ears. Drumheads are normal in appearance, but feebly movable.

CASE XVIII.

S. K. Aged 17 years; female.

Deaf. Since 9 years old.

Cause. Typhoid fever.

Family. Parents are not related; no deaf-mute relatives.

Anterior nares. Slight hypertrophy of left lower turbinate.

Posterior nares. Normal. The vomer appears to be split—as though doubled—through the center of its posterior edge.

Tongue. Normal.

Palate. Normal.

Pharynx. Mucous membrane is sclerotic. The left half-arch of fauces is lower than the right one.

Larynx. Normal; voice clear and distinct.

Ears. Drumheads retracted; feebly movable.

Hearing. Slight degree of hearing by air-conduction in right ear.

CASE XIX.

E. B. Aged 18 years; female.

Deaf. Since 7 years old (?).

Cause. Scarlet fever.

Family. Parents not related; no deaf-mute relatives.

Anterior nares. Normal.

Posterior nares. Normal.

Tongue. Short, thick frenum.

Palate. Normal.

Pharynx. Normal.

Larynx. Normal.

Ears. Drumheads move feebly; retracted.

Hearing. Trace of hearing by bone-conduction in right ear.

CASE XX.

W. McC. Aged 12 years; male.

Deaf. Since 3 years old.

Cause. Spotted fever.

Family. Parents not related; no deaf-mute relatives.

Anterior nares. Septum is badly deflected to the left. The triangular cartilage is in close contact with the left lower turbinate, and much muco-purulent discharge oozes from between these surfaces.

Posterior nares. Masses of enlarged adenoid tissue.

Tongue. Normal.

Palate. Normal.

Pharynx. Tonsils are large, filling spaces between their faucial pillars. The fauces has the general shape of an inverted V, and is narrow.

Larynx. Vocal cords are slightly hyperæmic; show a fair degree of tension.

Ears. Left. Drumhead is thick, granular, and retracted.

Right. Impacted cerumen, closing the canal.

Hearing. Trace of hearing by bone-conduction, right side.

CASE XXI.

J. F. Aged 12 years; male.

Deaf. Since birth.

Cause. Unknown.

Family. Parents not related; no deaf-mute relatives.

Anterior nares. Slight hypertrophy of both lower turbinates.

Posterior nares. Enormous enlargement of both lower turbinates, so that they extend beyond the posterior end of the vomer, swelling around, obscuring its lower half, and coming in contact with each other.

Tongue. Normal.

Palate. Narrow and high.

Pharynx. Tonsils encapsulated; mucous membrane of pharynx is sclerotic.

Larynx. Vocal cords show good tension; the arytenoids "interfere" with one another, the left tending to overlap the right.

Ears. Drumheads are greatly retracted and dull-white in color.

Of this list, it might be said, that nine cases present fairly normal vocal organs, viz., cases 6, 7, 9, 10, 11, 12, 14, 18, 19, while twelve cases, viz., 1, 2, 3, 4, 5, 8, 13, 15, 16, 17, 20, 21, are burdened with conditions of these parts, which must, to a greater or less degree, interfere with phonation, or with the training by which the deaf-mute is enabled to acquire speech. To what extent these twelve children would have been benefited by the removal of adenoids, enlarged tonsils, and the correction of nasal deformities, it is now impossible to judge, as they have been placed in the sign-language department and their oral training abandoned for so long a time that, practically, such training would have to begin *de novo*. In one case only, No. XVI. of the detailed list, has oral training been continued, the pupil, however, making no advance whatever. A little over one year ago, at the request of this child's mother and teacher, I performed an operation for the removal of the tonsils and post-nasal adenoid. The tonsils were of enormous size, extending from the top of the faucial arches, where they pressed upon the soft palate, to the upper edge of the epiglottis, and projecting so far into the throat as almost to be in contact with each other. They were covered by fibrous capsules.

General Remarks on this series of cases.

The boy recovered promptly, and his teacher has lately reported to me as follows: "I have noticed much improvement in Albert's articulation since the operation was performed. He has been entirely freed from the choking or filling up of the throat that attended nearly every attempt at vocalization."

As a result of my examinations and the operative work already done, I believe that the oral pupils should be treated—when treatment is necessary—before any prolonged attempts are made towards vocal training. Children with imperfect vocal organs are apt to acquire habits of phonation based on the presence of abnormalities, which will be more or less permanent even after the parts are rendered free from obstruction. Following this idea, I have operated, for the removal of such obstructions, upon four children in the last year's class, and improvement in the preliminary instruction is already reported by their teachers. The mere fact that tonsils are large, that the septum is deflected, that a small amount of adenoid tissue is seen in the naso-pharynx, is not, in itself, of sufficient importance to render operative procedures necessary. The facts to be considered are, whether the tonsils press upon the palate or sides of the tongue and interfere with their movements; whether the septum is in contact with turbinates or is retaining secretion in concavities of its surfaces; whether the post-nasal "adenoids" are obstructing this space, pressing on the eustachian openings, or causing mouth-breathing. In the reduction of hypertrophied or enlarged turbinates, it is, of course, first to be determined, whether such swellings may not depend upon vaso-motor paresis, and do not improve under sedative, cleansing, local treatment, combined with proper hygiene, diet, exercise, dress, and the general medication indicated.

The careful work of Holger Mygind, of Copenhagen, has demonstrated the central lesions existing, so often, in deaf-mutes, and the changes found within the labyrinth. Doubtless, there are many deaf-mutes who cannot acquire the oral-method, but I believe that failures will be less numerous, if, before the oral-training has advanced beyond the preliminary work, the pupil's organs of phonation, when abnormalities exist, are rendered as nearly normal as is possible.

I have said nothing in regard to the benefit such procedure has upon the health of the individual, as my motive was to deal mainly with the effects on phonation. It is no longer necessary

to prove the now well-established fact, that improvement in general health is an almost constant sequence to the removal of those obstructing masses which cause "mouth-breathing," or exert pressure upon the vascular tracts lying near the base of the brain.

LECTURE III.

It remains for me to give you a brief description of the conditions of the ear, which are most common to deaf-mutes.

The Ears of
Deaf-mutes.

I have already spoken to you, in passing, of the evil results following closure of the openings of the eustachian tubes, and I have mentioned, that such closure may result from the pressure against these openings and against the cartilaginous portion of the tubes, by hypertrophy of the post-nasal adenoid tissue, by hypertrophy of the lower and middle turbinates, and by thickening of the mucous and sub-mucous tissue resulting from long-existing catarrhal inflammation. By far the greater number of your pupils have lost their hearing as a result of these conditions.



Fig. 5 A.

VERTICAL SECTION OF THE EXTERNAL AUDITORY CANAL, MEMBRANA TYMPANI, AND TYMPANIC CAVITY, VIEWED FROM IN FRONT. (Politzer.)—*a*. Upper osseous wall of the canal. *n*. Lower osseous wall of the same. *b*. Tegmen tympani. *c*. Osseous floor of the tympanic cavity. *d*. Tympanic cavity. *e*. Membrane tympani. *f*. Head of the malleus. *g*. Lower end of the handle of the malleus. *o*. Short process of the malleus. *h*. Body of the incus. *i*. Stapes in the oval window. *k*. Fallopian canal. *l*. Jugular fossa. *m*. Glandular orifices in the skin of the cartilaginous canal. [From Burnett.

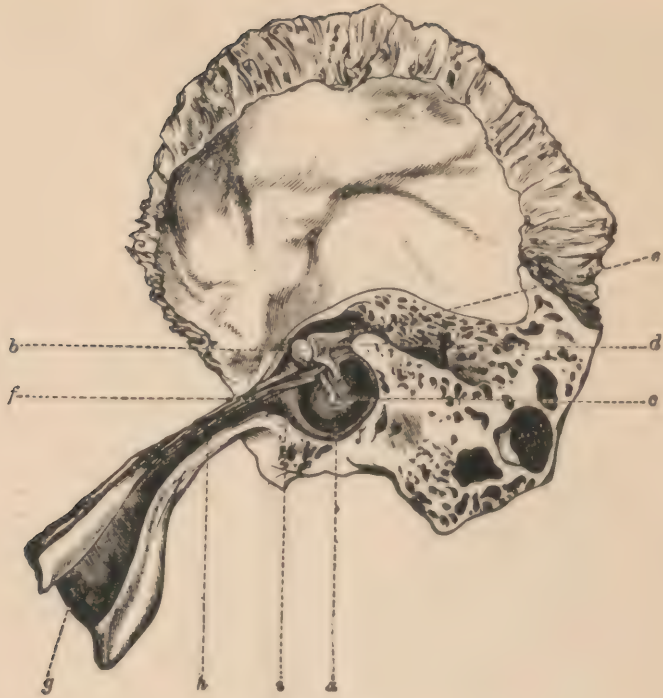


Fig. 5 B

VERTICAL SECTION OF THE RIGHT EUSTACHIAN TUBE, TYMPANIC CAVITY, AND MASTOID CELLS, WITH INNER SURFACE OF THE SQUAMA ABOVE VIEWED FROM WITHIN.—*a*. Membrana tympani. *b*. Head of malleus. *c*. End of the manubrium mallei. *d*. Incus. *e*. Short process of incus. *f*. Tensor tympani muscle. *g*. Faucial opening of the eustachian tube. *h*. Isthmus tubæ. *i*. Tympanic mouth of eustachian tube. [From Burnett.]

Brief Anatomical notes on the Ear.

A section made through the head at right angles to the median line, so as to bisect the external auditory canal, middle ear, and eustachian tube, shows the relation of these parts. It will be seen, that the drumhead stands at an angle of about 160 degrees in relation to the walls of the external auditory canal. Back of the drumhead, lies the middle ear cavity, containing the chain of three ossicles. The third, or most inner ossicle, the *stapes*, is set by its foot-plate into the "*oval window*." This *oval window* is one of the means of communication between the middle ear and inner ear. The most external ossicle, the *malleus*, is set into the body of the drumhead. Vibrations started in the drumhead are transmitted along the chain of ossicles to the foot-plate of the *stapes*, set into the oval window. The plunger action of this foot-plate transmits the vibrations to the fluid filling the complicated twists and turns of the inner ear, and into which extend the terminal filaments of the

auditory nerve. Ankylosis, or stiffening of the joints of the ossicular chain, adhesion between the posterior side of the drum-head and the posterior wall of the narrow tympanic cavity, or, simply, adhesion alone of the foot-plate in the margins of the oval window, will weaken the force of vibrations reaching the inner ear or may prevent their passage entirely. Such adhesion may follow, simply, from persistent closure of the eustachian tubes. As a result of this closure, there ceases to be any air within the middle ear cavity to counteract the atmospheric pressure pressing inwards through the external auditory canal. Such pressure without resistance, forces the drumhead inwards, forces the joints of the ossicles together, and forces inwards the *stapes'* foot-plate.

Pathology of
Sclerosing Pro-
cesses within the
Middle Ear.

This abnormal state of things interferes very soon with the blood circulation of the parts, inflammation results, and permanent adhesions are formed, which anchor these movable structures and convert the sound-conducting apparatus into a sound-*obstructing* apparatus. Again, as a result of active inflammation within the posterior nares or pharynx, we may find, that this inflammatory condition extends upwards along the tubes, involving the lining membrane of the middle ear. Such inflammation commonly exists during severe "colds in the head," Influenza, Measles, Scarlatina, Typhoid fever, Diphtheria, and a large variety of other general diseases which are accompanied with inflammation of the nose and throat. Resulting from such processes, we may have a variety of lesions, ranging from a simple thickening of the drumhead and the mucous coat of the middle ear cavity, to complete destruction of the entire sound-conducting apparatus by suppurative process, or by a process of stiffening technically called *Sclerosis*.

One or other of these conditions described has been the exciting cause of that early deafness which has prevented your pupils from acquiring speech. There are, however, instances in which the inner ear has been the seat of destructive processes. These have found their way inwards into the sound-perceiving department of the ear by means of the oval or round windows, or by destruction of the posterior wall of the middle ear cavity. They may, however, have started primarily within the inner ear and have caused wide-spread destruction, while the middle ear has been left almost, if not quite, intact. These changes within the inner ear may be classified under the general term of *Sclerosing*

Sclero^tic
changes in the
Inner Ear.

Destruction of
the Auditory
Centre.

processes, a conversion of that delicate and highly specialized arrangement of nerve cells, laid within an area, which, although small in extent, affords, by reason of its many coils, a wide stretch of surface, into a bony or fibrous mass. Still deeper may be found the lesions fatal to hearing, for the post-mortem table, where we have learned the changes within the inner ears of deaf-mutes, has revealed, also, certain destructive processes which are found occasionally within the brain, itself, which have ruined the cerebral centre for hearing or have spread destruction along those tracts leading through the brain, from this centre to the sound-perceiving apparatus of the inner ear. Let me close this dry review of this subject, by a reference to the conditions revealed by the examinations at the Pennsylvania Institution and the Glasgow school.

Examination of
the ears of 415
pupils at the
Pennsylvania In-
stitution for the
Deaf and Dumb.

In my examination of the 415 pupils in the Pennsylvania Institution for the Deaf and Dumb, I found conditions within the ear, as follows:—

	Sign-language pupils.	Oral pupils.	"Oral failures."	Total.
Individuals having drumheads which were quite normal in appearance,.....	54	24	3	81
Individuals having the objective symptoms of Plastic Otitis Media,.....	216	50	14	286
Individuals suffering from suppurative Otitis Media,.....	16	11	3	30
Drumheads showing perforations which had healed,.....	45	11	2	58
Cases of occlusion of the external auditory canals by impacted cerumen,.....	24	10	1	35
Foreign bodies found in the external auditory canal,.....	5	0	0	5
Deformed auricle, with imperforate auditory canal,.....	2	0	0	2
Individuals having decided trace of hearing,.....	62	28	10	100
Exostosis in bony part of auditory canal,	1	0	0	1

Second series
of Examinations,
106 Pupils at the
Pennsylvania In-
stitution.

From the second series of examinations made upon 106 pupils the following is recorded:—

Plastic Otitis Media,.....	34
Chronic suppurative Otitis Media,.....	8
Perforations of the drumhead which have undergone cicatrization,...	2
Impacted cerumen,.....	11
Foreign bodies,.....	2

It will be seen from these lists how frequent are the instances in which the appearance of the ears indicated a sclerosing process, either at an end or still active, within the middle ear. Another fact of some interest is the relatively large number of individuals whose auditory canals were closed by plugs of cerumen, as well as by substance totally foreign to the body. Such substances consisted of pieces of tin, sticks of wood, dead fly, and rolls of paper.

In some instances, the appearance of the occluding mass and of the skin lining the auditory canal indicated, that the foreign matter had remained for long periods within the canal.

Such facts lead me to believe, that the ears of deaf-mutes should be examined carefully and all such substances removed, as their presence, in many instances, may lead to cerebral or nerve irritation, and interfere with the health of the pupil. I have seen cases where a persistent cough, treated for many months by medicine internally, and by application of medicated pigments to the throat, under the impression that the individuals suffered from pulmonary and laryngeal disease, have been cured promptly and completely by clearing the auditory canals of foreign bodies or impactions of cerumen.* These nervous manifestations result from the intimate nerve connection of the external auditory canal, with the great Pneumogastric nerve, the Glosso-Pharyngeal nerve, and by the Otic ganglion, with the Sympathetic nerve system.

Another reason why the ears of deaf-mute pupils should be examined, is, that we may discover and properly treat all cases of Otorrhœa. Such suppurative process, if neglected, leads to serious interference with the victim's general health, by reason of the constant absorption of the purulent and offensive discharge, thus maintaining, in such subjects, a low degree of blood-poisoning. These individuals are, in addition, exposed constantly to the danger of extension of the suppurative process into the mastoid cells, the inner ear, and the cerebral membranes.

By far the most frequent cause of cerebral abscess is to be found as a result of the neglect of such suppurative cases. The deaf-mute appears to be much less complaining, in regard to such conditions, than would be the case with ordinary individuals. Finding it difficult to attract the attention of his caretakers to his occluded or discharging ear, he may, in time,

General Remarks on these two series of Examinations at the Pennsylvania Institution.

Frequency of Sclerosis of Middle Ear.

Frequency of the Presence of masses impacted Cerumen, or of Foreign Bodies in the External Auditory Canal.

Important that the Ears of Deaf-mute Pupils should be carefully examined.

*These patients had not been treated by physicians, but by unskilled members of their own families.

become accustomed to the pain or discomfort, especially as no interference is caused with his power of hearing, which is already lost.

Many pupils show a decided trace of hearing.

It will be noted, also, how large is the number of pupils showing decided trace of hearing. In my own series of examinations, this question was not developed with as much care as Dr. Kerr Love has devoted to it.

Dr. J. K. Love's Examination of the Ears of Pupils, 175, at the Glasgow Institution for the Education of the Deaf.

I find that the hearing-power, when present, except in an exceedingly limited number of cases, is so imperfect, that it would be quite useless to attempt any treatment for improvement in this regard. Dr. Kerr Love, of the Glasgow Institution for the Deaf and Dumb, has recorded the results of his examination upon the ears of 175 pupils. Taken as a class, he finds that "congenital deaf-mutes are *deaf*er than acquired deaf-mutes." Among the acquired deaf-mutes, he finds the most frequent cause of deafness to have been "Brain Fever." He finds:—

	Acquired deaf-mutes.	Congenital deaf-mutes.	Doubtful.	Total.
The drumheads normal in.....	28	20	7	61
Suppurative otitis media active or extinct	18	11	5	32
Charges indicating non-suppurative catarrh	54	35	11	78
Unexamined cases.....	1	1	1	2
Meatus too narrow for examination...	—	2	1	2

About seventy per cent. of these pupils showed distinct "thickening of the tonsils, pharynx, or of both these structures." In thirty-three per cent., the tonsils were enlarged.

I think that these findings of Dr. Kerr Love tend to emphasize what I have already remarked in commenting upon the results of my own examinations.

Dr. Thomas Barr's Examination concerning the Hearing power of School Children.

As a means of comparing the aural conditions of the pupils of deaf-mute schools with pupils of ordinary educational institutions, I would call attention to a paper by Dr. Thomas Barr, of Glasgow, in the *British Medical Journal* for September 28, 1889. The article is termed, "An Investigation as to the hearing of School-children." Dr. Barr, at first, refers to the great liability of children to aural disease. Among 3,456 persons, treated in the Glasgow Ear Hospital, 1169 or 35 per cent. consisted of children under fifteen years of age, "the time of life

when speech and education are usually acquired." Dr. Barr's examinations were conducted upon six hundred children varying in age from seven to fourteen years. They were about equally divided as to sex, and were selected from two schools of quite opposite social grade. One hundred and sixty-six pupils or 27.66 per cent. were found defective in one or both ears. For the sake of comparison, he quotes the findings of other observers, from similar examinations, thus—Sexton, of New York, found the percentage of partially deaf pupils to be 13 per cent.; Weil, of Stuttgart, 33.37 per cent.; Moure, of Bordeaux, 17.0 per cent.; Bezold, of Munich, 22 per cent. Dr. Barr found that the imperfect hearing among the pupils whom he examined was associated frequently with nasal disease and with a certain abnormal tendency to "take cold in the head."

Other Examinations regarding the Hearing-powers of School Children.

I would refer, also, to a paper by Dr. S. S. Bishop, "A Statistical Report of 5,700 cases of ear disease, classified by age, sex, occupation, and disease"; Transactions of 9th International Medical Congress, 1887. This paper is of especial interest, as it gives us a comparison between the frequency of aural diseases found among the pupils of two deaf-mute institutions, and of those found among a large number of patients from aural diseases, for which they are undergoing treatment. Of the entire 5,700 cases—

Dr. S. S. Bishop's Examination of 5,700 cases of Aural Disease.

5.1 per cent. had acute catarrhal inflammation.

5.3 per cent. " " suppurative "

53 per cent. " " non-suppurative "

The external ear was affected in 8 per cent.

The internal " " " " 2 " "

Deaf-mutes constituted 6 per cent. of the 5,700 cases. The two sexes were affected in about equal proportions. Children under fifteen years of age constituted about 28 per cent. of the whole number of cases.

In closing this series of lectures upon the gross pathological changes which have been observed within the ears and upper respiratory tracts of deaf-mutes, we may find it of advantage, that the main points of our study should be condensed into the conventional series of "conclusions," a sort of moral to the tale.

Following this plan, therefore, I would present the following review of our discourse, to which are added impressions of my own based on experiences which the limit of our time has not allowed me to place before you in full explanation:—

CONCLUSIONS.

Frequency of Abnormalities of Nares, Post-nares, and Pharynx.

1st. We have evidence, that abnormalities of the nares, naso-pharynx, and pharynx are found very commonly among deaf-mutes, and, that such lesions tend to interfere, in varying degree, with the successful training of the deaf pupil in vocalization.

The cause of many Failures among Oral pupils.

2nd. Although in no way claiming that such mechanical causes are the only grounds for failure in acquiring speech, it is reasonable to believe, that, in many instances, the presence of hypertrophied tonsils, masses of overgrown adenoid tissue in the naso-pharynx, deformities of the nasal septum, and hypertrophy of the turbinated bodies cause such obstruction to respiration and such interference with the movements of parts concerned in articulation, that the oral-pupil becomes an "oral-failure." In addition, it may be stated, that where such an extremely unsatisfactory result is not produced, the voice formed in spite of these obstructions is far from being as pure and distinct as would have been the case had the parts been rendered more nearly normal.

Suggestions regarding the Management of Pupils having serious Deformities within Nares, Post-nares or Pharynx.

3d. Before beginning the oral training, the pupil should undergo inspection by the Laryngologist of the school, in regard to the conditions of his nares, posterior nares, pharynx, and ears, and all diseased conditions should be noted. When the examiner finds, that occlusion to parts of the upper respiratory tracts are so pronounced as to cause persistent mouth-breathing or pressure against the tongue or the soft palate, the parts should be rendered as nearly normal as possible, before education of the pupil is commenced. When, however, such conditions are less marked, the child should be placed in the hands of the teachers, to be by them referred back to the surgeon, if, after a fair trial, it is found, that such a pupil fails to progress in vocalization. In short, operative work must be resorted to when necessary. It can be limited to a relatively small number of individuals; yet, it is to be resorted to in all cases, where experience proves, that such procedure is required.

Frequency of Acquired Deaf-mutism.

4th. It seems evident, that by far the majority of deaf-mute pupils have lost hearing as a result of diseases subsequent to birth; *i. e.*, are acquired deaf-mutes.

Sclerosing Processes, the most common Cause of Deafness in Deaf-mutes.

5th. The most common lesions which appear to have caused loss of hearing are to be classified under the term, sclerosing processes of the middle ear. In a certain proportion of cases—the exact percentage I cannot give—this process within the middle ear is associated with a similar condition, which has

attacked and altered the elements of the sound-perceiving apparatus, *i. e.* the *Labyrinth*. Congenital deafness is a most uncertain diagnosis, and can be positively elucidated only on the post-mortem table—a location as unsatisfactory for the pupil and his friends, as it is interesting to the scientific investigator.

I believe it to be a far from common condition, and that it is found mainly among the offspring of persons suffering from Alcoholism, Syphilis, Epilepsy, or whose cerebral development is imperfect, such as cretins and idiots.

6th. The common cause for the middle ear diseases associated with loss of hearing are the exanthemata, the neglect of proper hygiene during childhood, injudicious treatment during attacks of acute inflammation of the nares, pharynx, and middle ear, and the existence of abnormalities of the upper respiratory tract, which cause occlusion of the air-passages, pressure on the lower portions of the eustachian tubes, and chronic inflammation of the entire tract.

Causes of Middle Ear disease.

7th. I believe, that attempts to restore hearing to a child almost totally deaf and who is, also, mute or semi-mute will result, usually, in failure, and that, as early as possible, such children should be placed in institutions for oral training. When the attempt at medical treatment appears to be rational, it should not be continued for a term of months after its hopelessness has been made manifest. A few months, at most, should decide this matter, and the child should, then, be referred to the proper school for its oral training.

Importance of placing Deaf-mute children early in Oral Schools.

I have taken you over wide fields, at a rather breathless rate of speed; not the flowery meadows of the world of literature, where poets sing to you of the beauties of the life within, and of that without, the soul; where the grave philosopher tells you of the things which go to make our joy and sorrow; where the jester laughs away the hours, and bids you laugh, if you would kill Dull Care. Our way has led through those shadeless levels of dry facts which belong to what we call the world of science. I must thank you for your company, and for that friendly spirit which has not grumbled at my cuts across lots, turnings, and counter-marches, but, which, like Charity itself, has endured all things and endured to the end. In thanking you for this rare patience, I would, also, express the hope, that you have gathered a few handfuls of sand in our desert-walk, and, that, among them, something of worth may remain to you after the useless part has been cast away.

...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...

...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...

...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...

...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...

...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...
...the ... of the ...